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## WEST EUROPE REPORT SCIENCE AND TECHNOLOGY

No. 126

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## ENERGY

COMPANY FORMED TO PRODUCE, MARKET COAL-WATER FUEL IN SWEDEN

Stockholm SVENSKA DAGBLADET in Swedish 1 Oct 82 p 27

[Article by Annabell Dahlberg: "Sonesson's New Energy Company"]

[Text] Energy costs can be reduced by 15-20 percent with the new coal-water fuel fluid carbon, an alternative to oil which will now be launched in Sweden and on the world market.

Volvo-owned Sonesson has 51 percent of the newly established Fluidcarbon AB. Professor Bjorn Lindman and civil engineer Lars Stigsson have developed the coal-water fuel fluid carbon in parallel with a special type of burner. The Swedish firm will be both a production and a marketing company. The managing director will be Conny Johansson and the president will be Anders Wall.

### Rebuild

"Fluid carbon is going to be integrated into the infrastructure of oil," said the managing director of Sonesson, Hans-Eric Ovin. "Conventional burners can be converted, and means of transport are comparable with those for oil. According to our calculations energy costs could be 15-20 percent lower than with oil, despite conversion costs, over a period of 8 years."

In the new Swedish company, which will have a stock capital of 50 million kronor, the chemical company Kema Nobel is going in with 9.5 percent, the Malmo company Electro Sandberg with 5 percent, the American chemical company Allis-Chalmers with 9.5 percent, and the inventors themselves with their own company Fluid Carbon International with 25 percent. The fluid carbon process has been tested in Malmo, and with the present production facility at Malmo harbor 30,000 tons per year can be produced. On the customer side, Lund power plant and Volvo's Olofstrom plant have arranged for continuous operation.

"We will get started soon," said Hans-Eric Ovin. "We are aiming for a production of 500,000 tons next year. That corresponds to 250,000 tons of oil. But then we must have a larger facility than we now have in south Sweden."

9287

CSO: 3698/32

## ENERGY

### BRIEFS

SOLAR CENTER--Federal Research Minister Andreas von Bulow laid the cornerstone for the new AEG-Telefunken solar center in Wedel/Holstein on 2 July. By mid-1983 a 6000 m<sup>2</sup> pilot production plant for solar generators and for a special solar research laboratory will be constructed there with BMFT funding. The costs for solar generators should be reduced and new applications explored for photovoltaic energy conversion systems by this facility using series production with simplified process and manufacturing methods. The erection of the solar center would also promote the goal, as stressed by von Bulow, of cooperation with countries where the use of solar energy is particularly promising, through training of international partners in the area of solar engineering. By means of solar engineering, not only can there be a contribution to an improved energy supply at home and in third-world countries, but international exchange of new technical products could be enhanced. [Text] [Duesseldorf VDI NACHRICHTEN in German 16 Jul 82 p 1] 9280

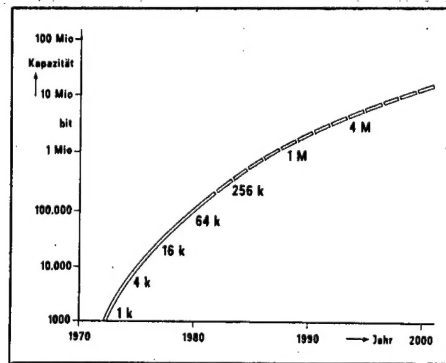
COAL-WATER FUEL--An energy system that within several years could reduce Sweden's oil bill by billions now is being marketed commercially by the Malmo company Sonesson, which is owned by Volvo. Along with four part-owners, this company is forming Svenska Fluidcarbon AB, which will have an initial capital stock of 50 million kronor. Sonesson will be the majority stockholder with 51 percent of the shares. The new company has purchased the rights to the so-called fluid carbon process for the Swedish market from a company in Malmo. The process uses finely ground pure coal mixed with about one fourth water. The proper combustion and flow properties are provided by adding a mixture of three secret chemicals. Sweden now has boilers capable of producing 15,000 MW that could be converted profitably to use the "liquid coal." The newly formed company already has a production facility at Malmo harbor, but hopes to increase production tenfold at a newly constructed plant. Sonesson's executive vice-president Hans-Eric Ovin cannot say where the new plant will be. "We are considering various sites. It may be in Malmo, Trelleborg, or perhaps in Landskrona." The Lund Power Board and Volvo Olofstomsverken will be the first customers to buy the "liquid coal." "According to our calculations, our customers could reduce their energy bill by 15 to 20 percent," Hans-Eric Ovin said. He did not wish to discuss what effect the project would have on employment in southern Sweden. [Text] [Stockholm DAGENS NYHETER in Swedish 1 Oct 82 p 2] 9336

## ELECTRONICS

### SIEMENS CPU TECHNOLOGY: GREATER PACKAGING DENSITY

Wuerzburg ELEKTRONIKPRAXIS in German Jul 82 p 72

[Text] Since 1972 there has been a total of four generations of semiconductor memories each occurring every 2 to 3 years. The capacity of the memory components rose during this time by a factor of four.



Every 2 or 3 years the MOS memory capacities have quadrupled.

Siemens is using, for example in computers, the in-house developed and produced 64 Kbit chip. The next generation, the 256 Kbit memory chip is currently under development by the firm.

#### Time Savings Through Short Pathways

In addition of software-programmed microprocessors, the Siemens central processing units use logic components (Gate-arrays) whose particular, specific functions are established via hardware in the last production step. The Gate-array chip with 36 logic cells developed and produced by the firm using this so-called Master-Slice method, provides the highest processing speed in the series 7500 CPU. A Master-Slice-Gate-Array with 120 logic cells is already under development. Its gate transit-times will be less than 0.5 ns. The fast interplay between the memory registers and processing circuits is of great importance in the CPU. Therefore, Siemens for the first time embedded a memory field (RAM) between the logic cells in one of its newest Master-Slice-Chips. With only 3.5 ns access time, it is among the fastest semiconductor memories in the world.



This increases the danger of soft-errors, that is, wrong circuits, which occur rarely and are not reproducible. They are caused in the first place, by minimum electrical disturbances, and secondly, by Alpha-particles from the environ of the chip, and also by particles from general cosmic radiation.

#### Soft Errors on the Track

These effects would lead to several errors per day in the working memory. This problem is countered by two measures: The 64 Kbit MOS chips are coated with a Siemens-developed, photolithographic structurable protective polyimide layer which absorbs the alpha-radiation. But mainly the CPU operates with a "Correction-refresh" in the working memory. At regular time intervals, the content of the working memory is read automatically and without affecting the CPU, fed through an error correction device and rewritten again without error.

In the new models 7.561 and 7.571 the pipeline-principle is used at five locations. Thus, up to five commands can be handled simultaneously which corresponds approximately to a four-fold increase in performance over a serial processor operating at the same speed.

9280

CSO: 3698/24

## ELECTRONICS

### SWEDISH COMPANY PRODUCES PLASMA ETCH EQUIPMENT

Stockholm NY TEKNIK in Swedish 12 Aug 82 pp 8-9

[Article by Sture Skold: "Englishman in Malmo Breaks U.S. Dominance--First Swedish Machine for Etching Circuits With Plasma"]

[Text] Malmo--Steve Byars, a 24-year-old Englishman living in Malmo, is the creator who broke the dominance of the Americans. He is behind the first Swedish-built machine which etches so-called chips in silicon plates using a plasma technique. Electronic scientists and manufacturers will now be able to continue the hunt for even more compact chips with machines which are cheaper than American counterparts.

In spite of being 24 years old, he was for 4 years the production manager for Nano-Tech Limited in England. It is a business which produces chambers and entire systems in plasma technology.

Now he works at Vacutec in Malmo. That company is launching the new reactor chamber. Normally Vacutec works on cooling techniques for the food industry and on vacuum pumps.

It was a natural development for the company to also try to produce a reactor chamber for dry etching of silicon plates, and in this way to produce chips, according to Goran Wrambeck at Vacutec.

"Previously the Americans have been alone in this type of production, and could therefore charge excessive prices," said Goran Wrambeck. "Now we have begun our own production in Scandinavia and that is good for competition and good for the price structure."

#### Customers' Requirements

"Furthermore we can fit our production to our customers' requirements, and one need not purchase more than he requires."

The reactor chamber which is being made in Malmo is primarily for research and fabrication of IC circuits in small numbers. The apparatus can be used for training, to train processing technicians for the semiconductor industry, fabrication of semiconductor prototypes and for different industrial projects.

The first machine went to the Institute for Applied Electronics in Stockholm, and is going to be used there for lithographic research. This means to investigate how thin lines it is possible to draw on a silicon film, which is decisive for how much information can be stored in an IC circuit. Today it is common to work with lines about 2-3  $\mu\text{m}$  (1  $\mu\text{m}$  = 1/1000 of a mm), but scientists want to reduce that to under 1  $\mu\text{m}$ , and so a new technique is required.

Plasma technology has proved to be very appropriate here.

In plasma etching a plasma is created by passing a high voltage between two electrodes enclosed in a thinned gas. The electrons in the high voltage release gas atoms which in different ways cause the line pattern which is exposed on the silicon plate.

#### Pressure and Heat

Different gases produce different effects, which are also influenced by pressure and heat. And it is that which science is studying. It is also possible with the aid of the reactor to turn the process so that instead of etching lines on a silicon plate, to make a so-called plasma deposit. That means to build a mesh on the exposed surface with the aid of different gases.

"We have previously cooperated with the Microwave Institute and received the results from the reactor chamber which they have there," said Stefan Svensson at KTH [Royal Institute of Technology]. "But it is important from a training standpoint that we get another."

"Now we can test our results sooner and we can also work more independently. We can also wet etch with acids, but that does not produce such thin lines as plasma etching, since the fluids take more than is necessary."

#### Lund in Line

In Sweden it is Chalmers in Goteborg which leads in training in semiconductor technology, but KTH in Stockholm is also well ahead. Next in line to get its own reactor chamber is LTH [Lund Institute of Technology], but there nothing has been decided. There they also have an interest, together with a group of electronics firms, in building up an entire line for the production of chips.

## Great Interest in the Reactor Chamber

Rifa, L. M. Ericsson's development company for integrated circuits, among other things, will borrow a reactor chamber from Vacutec in the fall. Asea is also interested, as is Volvo. Automobiles of the future are going to be all the more computerized, and the need for their own system with IC circuits is going to grow.

Otherwise the interest for production of own IC circuits is not so great in Sweden. The market is just too small. The great interest is in Europe.

The next reactor chamber that Vacutec is building is going to Plasma-Therm in England, a company where Steve Byars previously worked and which now has intimate cooperation with Vacutec. Beyond that, expressions of interest have been received from seven other firms in Europe.

"Since we presented our small and inexpensive reactor chamber a couple of weeks ago, everything has gone so fast that we can barely keep up," said Goran Wrambeck. "Which orders or how many we will have in 2 months I have no idea."

In the fall Vacutec will also present a larger reactor chamber for "sputtering" and thin film production with plasma techniques. The thin film prolongs the life of cutting tools such as drill steel and milling steel.

"It will go to the Technical Center at the University of Linkoping, and we will share their processing experience. Such cooperation is worth gold."

9287

CSO: 3698/32

## INDUSTRIAL TECHNOLOGY

### RESEARCH MINISTRY SPONSORS PRODUCTION ENGINEERING PROGRAM

Duesseldorf VDI NACHRICHTEN in German 13 Aug 82 p 4

[Article by Ingward Bey: "Automation All Around the Machine"]

[Text] Flexible interconnection and work piece handling are the main points in the production technology promotion program. After the actual processing procedures in cutting production in recent years were extensively made available to automation especially through increased use of NC equipment, a new development concentration point is arising all around machines: Automation of charging of and waste removal from machines also in the range of smaller and medium lot sizes.

Flexible production cells have increasingly been developed and have been displayed at technical fairs. Some of these cells were also promoted with funds from the Federal Ministry of Research and Technology (project manager: Karlsruhe Nuclear Research Center, Incorporated).

In these cells, the following functions are completely or partly automatic: Feeding, charging, inserting, clamping, processing, measuring, removal, storage; this in many cases facilitates an approach to unattended production which of course is limited in terms of time but which nevertheless is significant. This is the basis for the automated factory and what we have here are essential building blocks for the gradual introduction of new technologies.

The system boundaries, which are drawn more tightly compared to flexible production systems, give us easier utilization possibilities in smaller and medium enterprises: Investment volume, scope of technical solution to be contemplated, risk, extent of organizational adjustments--these remain clear and can be handled.

An interesting distinguishing feature of the currently known flexible production cells is the manner of automated charging of machines from a work piece storage unit.

In turning machines or rotation parts there are predominantly three possible solutions:

Charging by means of industrial robots. Many examples in this connection were displayed at the last EMO in Hanover, for example, a chuck lathe (by Diedesheim) for large work piece diameters of up to 1,200 mm with a "Unimate 2000" robot, a WS 401 NC gear shaper (by Liebherr) with handling instrument (by ZF), or an RNC 600-E horizontal turning machine (by Montforts) with loader, as hydraulic system (by Fibro). These solutions are also suitable for subsequent installation on existing machines but as a rule often entail the disadvantage that they take up additional space, that they reduce the room available for operation and attendance, and that, in terms of control technology, they contain two separate systems for processing and charging.

Charging by means of robot-like handling accessories attached to the machine; by way of example we have here the NC turning automats (by index) with the "Auto-Servant" manipulators of the WHF construction series or the "Slant-Turn 15" lathe with "Flex 1" handling instrument (by Yamazaki, Japan). These solutions are elegant, space-saving, and offer the user systems from one particular maker. For the manufacturer, this solution however represents design adaptation of the machine to the handling function.

Charging by means of integrated, universal handling instruments in the portal version: here among other things we know the MD5S lathe with portal grabber and interconnection building blocks of the MDS-Automation system (by Gildemeister) and the CNC automatic lathes with FHS flexible portal handling system (by Traub).

In the milling and drilling area or for prismatic parts, manufacturers are offering processing centers with pallet exchangers and pallet pool on the market. Examples here are the Hueller-Hille CNC processing center model nb-h 70 with work piece pallet rotary magazine for eight or more pallets and transfer station (by Hueller-Hille), the CNC milling center with pallet storage unit and work piece exchange mechanism coupled with automatic clamping (by Maho) or the MC-100 processing center (by Heidenreich & Harbeck/Makino).

The charging mechanisms described moreover as a rule offer a good beginning toward the interconnection of several machines. Of course, this problem is more difficult to solve than mass production where the various mechanisms in many cases are coordinated with a single part. Automatic interconnection will be worth the trouble only in small series when there are good possibilities for the magazine storage of parts in one particular lot. Transport from machine to machine or from cell to cell can be accomplished via a standard magazine. Past solutions pertain mostly to rotation-symmetry parts such as shafts for small motors, spiral drills, disks, disk rings, and the like. The flexible design of the magazines, of the charging and removal mechanisms, of the grabbers, etc., is a difficult task and essentially depends on the work piece spectrum which is to be moved.

The automation of charging and transport of prismatic parts is also made more difficult by the need for clamping. On the one hand, there is no universal pallet and there is no universal device building block set; on the other hand, the process of clamping is presently automatable only to a limited degree.

In this article we have been able to touch only on a few of the many problems and possible solutions connected with flexible work piece handling. There are many additional aspects here; they concern above all measurement technology and quality assurance (automatic production makes sense only if we get "good" parts), the control-engineering component (the automated solution must also be clear, maintainable, available, and controllable for the smaller enterprise), and the organization as such (new production concepts must be fitted into the plant organization or viceversa and the latter must be adapted to the new production process. If necessary, personnel must be retrained).

5058

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IMPROVED TECHNIQUES FOR MACHINING KEVLAR DEVELOPED

Paris L'USINE NOUVELLE in French 23 Sep 82 p 128

[Article by Pierre Laperrousaz: "Knowhow and Style in Machining Kevlar"]

[Text] Using specialized cutting tools, it is possible to prevent lint-formation and fraying of Kevlar-fiber composite materials during drilling and milling.

Now that high-performance composite materials are making a decisive breakthrough in aeronautical engineering, it may be helpful to consider certain implementation problems which, although trivial at first sight, are nevertheless an obstacle to the mass-production of these materials. One of these problems is the machining of composite materials containing Kevlar aramid fibers. These are hard to cut. As a result, the composite material will fray when conventional fabricating tools (drill bits, milling cutters, saws, etc.) are used. This is why, since DuPont de Nemours introduced this material on the market, they have collaborated with users in trying to develop better adapted tools and procedures.

The latest of these research and development programs has just been completed. It was carried out by the Fraunhofer Institute in Aix-la-Chapelle, together with DuPont de Nemours International SA (Geneva) and Messerschmitt-Boelkow-Blohm, MBB (Hamburg); the latter manufactures the Airbus 310 vertical stabilizer. The objective was to design tools and determine working parameters for the series drilling and milling of perfect holes, without lint formation or fraying of the reinforcement fibers, and without delamination on either side of the holes, in a laminated composite materials with a mixed reinforcement made of carbon-fiber and aramid fabrics.

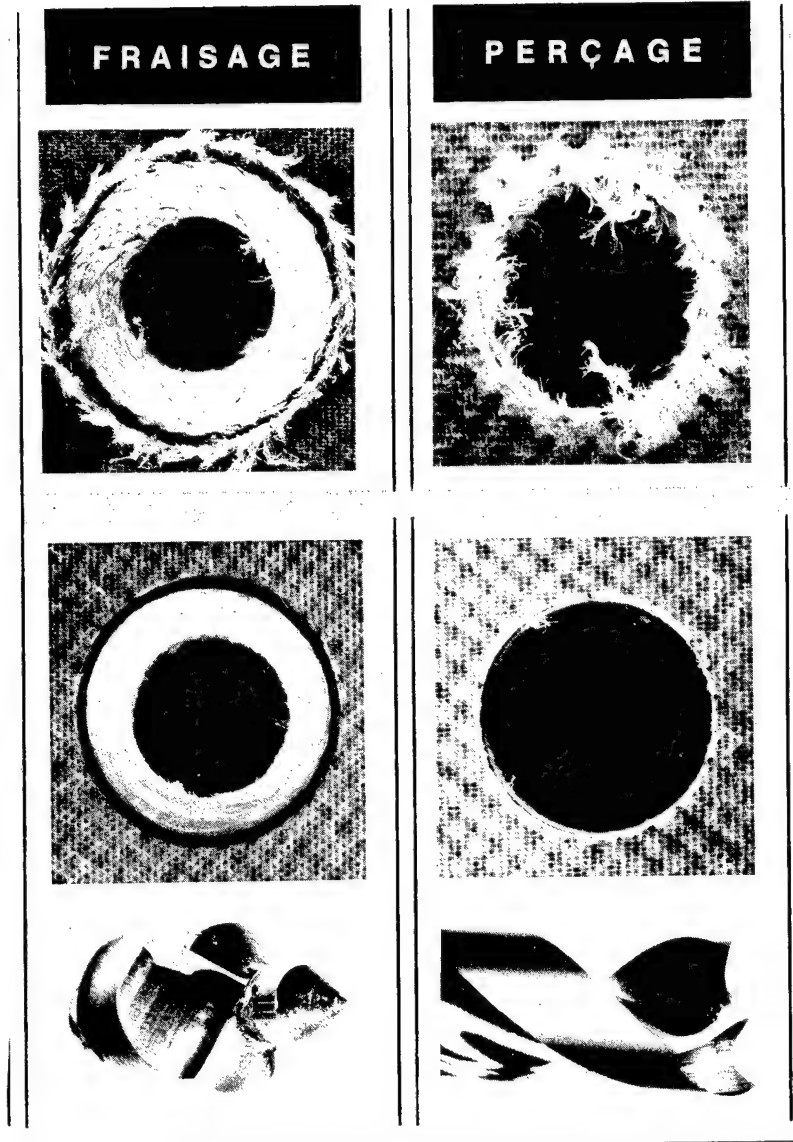
Single-Spline Helicoidal Drill Bit

In drilling, the best results are obtained with a single-spline helicoidal drill bit developed by MBB and manufactured by Klenk (Balzheim, FRG). It differs from traditional drill bits in that its cutting edge is crescent-shaped. Systematical testing has shown that the helicoidal angle should be



# Drilling

# Milling



Traditional tool

Tool designed for the machining of composite materials

Bit and milling-cutter developed by MBB

Comparative Drilling and Milling Tests

(Photographs: DuPont de Nemours)

between 29 and 35°, and the rake angle between 12 and 20°. Durability is improved when special carbides are used: K 10 for fixed drilling machines, and P 25, which is harder, for hand-drills. A 5.6-mm diameter drill bit was used to drill over 1,200 holes, i.e. a total work length of 3.6 m, in a 3-mm thick laminated material. A slight blunting of the drill-bit points was observed, but the bit could still be used. The cutting speed was 150 m/min at a feed rate of 0.05 mm/revolution. Feed guiding is necessary to ensure consistent quality when a great many holes are drilled. The same principles apply when designing a milling cutter: the tool must push the fibers from the periphery toward the inside of the laminated material.

#### Milling Cutter With a Guiding Point and Two Cutting Edges

Tests on many bits and milling cutters resulted in the selection of a milling cutter with a guiding point and two cutting edges, providing a balanced distribution of cutting forces at a minimum cost. To minimize the cost of this tool, which is manufactured by Guehring (Albstadt, FRG), carbide cutting edges were welded to a steel matrix, the degrees of hardness being the same as for the drill bit. The characteristic sickle shape of cutting angles makes it possible to push the fibers toward the center and to produce clean burr-less edges. Ideally, the rake angle is between 6 and 15°. The feed rate must be high enough to obtain a smooth surface. Over 1,500 milling operations were completed without any quality loss using a feed rate of 0.3 mm/revolution and a cutting speed of 45 m/min; this represents a 400 percent improvement over the bits previously used.

9294

CSO: 3698/31

## TRANSPORTATION

### SAS TO REBUILD FOUR UNWANTED AIRBUSES FOR FASTER SALE

Stockholm NY TEKNIK in Swedish 22 Jul 82 p 4

[Article by Fredrik Dhejne]

[Text] SAS cannot get rid of its unprofitable Airbus planes.

For this reason, SAS will modify the four planes to give them a longer range. Then there will be a better chance of selling them.

After the modifications, they also will be better suited for charter traffic to the Mediterranean Sea and the Canary Islands.

The planes have been for sale since last spring, but the bids have been too low. It is believed that selling them at a low price would be worse than keeping them for limited use.

Management also has tried to convince the board to approve modifications. The SAS board, however, believed it was too great a risk to invest even more money in the unprofitable planes.

The matter will come up again at the next board meeting this August. Nils Molander, chief economist and vice president, said that the situation had changed and that the board now was positive toward the move.

#### Must Be Modified

"It has become clear that if the planes are to be rented or sold, they must be modified."

He also said that the charter market was showing a certain upswing and that the sister company of SAS, Scanair, would be interested in the planes if they were given a longer range and more seats.

"Because of the upswing in the charter market and the fact that SAS is doing much better now, the board probably will be more inclined to accept this investment," Nils Molander said.

The modifications will cost about 15 million kronor per plane. The planes

would be provided with the same fuel tank SAS rejected when the planes were purchased.

#### New Navigational Instruments

At the same time, the planes will be equipped with the same type of radio and inertial guidance system SAS uses in its long-distance planes--the DC 10's and the Boeing 747's.

The modifications could begin early this fall and be complete by March or April of next year.

The modifications take 2 months per plane. The total time will be longer, however, since there is a waiting period for the fuel tanks.

#### Rebuilt At Arlanda?

The first plane will be rebuilt by the Airbus companies, either at the Toulouse plant or at one of the group's plants in West Germany.

One or two of the planes may be rebuilt at the SAS maintenance shop at Arlanda. Both the know-how and the equipment for major fuselage work are available there.

9336

CSO: 3698/22

## TRANSPORTATION

### MAGNETIC LEVITATION: 'TRANSRAPID INTERNATIONAL' FORMED

Munich-Ottobrunn MBB AKTUELL in German Jul/Aug 82 p 7

[Article by Dr Peter Bittner: "Thyssen Henschel Joins Transrapid Study Group"]

[Text] Munich/Ottobrunn. At the end of June 1982, Krauss-Maffei AG [Incorporated], Munich, MBB [Messerschmitt-Boelkow-Blohm], and Thyssen Industrie AG Henschel, Kassel, agreed in the future together to develop the Transrapid rail system to the point where it would be ready for use and to prepare its introduction at home and abroad. For this purpose, Arge Transrapid EMS (Krauss-Maffei/MBB), which has been in existence since 1974, was expanded through the addition of Thyssen Henschel and was renamed TRI (Transrapid International). The new name in particular is also intended to take into account growing foreign interest in German magnetic rail system development.

The parent companies of TRI have always been active in the area of rail vehicles, such as locomotives, passenger cars, etc., for commuter and long-distance traffic and are decisively involved in their further development. All of them are pioneers in the rather novel magnetic train system. Between 1971 and 1979, they developed, built, and successfully tested several systems with six vehicles.

As part of the Transrapid Magnetic Rail System Consortium, Krauss-Maffei, MBB, and Thyssen Henschel are presently, together with the firms of AEG [General Electric Company], BBC [Brown Boveri & Cie.], Dyckerhoff & Widmann and Siemens, developing the Transrapid experimental facility in Emsland, with assistance from the BMFT [Federal Ministry of Research and Technology]. This is where trial operations are to be started in the summer of 1983 with the 400-km/hr Transrapid 06.

The following were appointed as TRI business managers: Horst Hessler (spokesman), Erich Eitlhuber, Hans-Georg Raschbichler. On the TRI board, we have Sepp Hort, from MBB, as deputy chairman of the business management, and Johannes Schubert, director, Space Travel Division of MBB. Dr-Engineer Helmut Hucks, a member of the board of directors of Thyssen Industrie AG, is chairman. Other board members are: Dr Hans-Heinz Griesmeier, chairman, board of directors,

Krauss-Maffei AG Munich; Gottfried von Alten, director, Chief of the Transportation Technology Division, Krauss-Maffei AG; Robert Jasper, director, engineer, chief, locomotive production division, Thyssen Industrie AG Henschel, Kassel.

It is the purpose of TRI to develop the magnetic rail system further and, by carrying out studies and planning efforts of all kinds, to prepare and carry out its introduction above all abroad. For example, feasibility studies are already underway for the use of magnetic rail systems between Las Vegas and Los Angeles and Montreal--Ottawa.

International cooperation with consultant and industrial enterprises will be very important in the execution of this kind of work. TRI starts with the assumption that construction of the first magnetic rail line for public operation can be started during this decade. MBB expects considerable industrial progress from the activities of this company in the development of the magnetic rail system for the first commercial use of magnetic suspension technology in practical application projects.

5058

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## TRANSPORTATION

### MBB EXHIBITS NEW WHEEL-ON-RAIL TECHNOLOGIES AT SHOW

Munich-Ottobrunn MBB AKTUELL in German Jul/Aug 82 p 5

[Text] Ottobrunn. The MBB [Messerschmitt-Boelkow-Blohm] UD (Rotary Wing and Transportation) Division displayed its new technologies in the wheel-rail field to a broad public at the "Transpo '82" transportation exhibit in Munich between 15 and 19 June and on the occasion of the 75th anniversary of the Federal Railroad Central Office in Munich between 25 and 27 June.

In an impressive presentation, UD at Transpo '82 presented technology for the Super-IC, constituting the creative application of aviation and space technology for the wheel/rail traction system of the next generation. A high degree of operational flexibility due to the multiclass concept (one frame or compartment for all interior variants), attractiveness due to the composite [sandwich] fiber material trucks and aluminum frames, as well as a low degree of wear and tear due to wheel sets with adjusted slippage distinguished this 300-km/hr train system.

The FVW [composite fiber material] truck and the wheel set with regulated slippage, which are being developed with the support of the BMFT [Federal Ministry of Research and Technology], aroused great interest among the experts attending the show. Tremendous weight savings are being achieved through the first-time use of composite [sandwich] fiber materials in the primary structure of undercarriages. The wheel sets with regulated slippage stabilize future train systems so that high-speed runs with little wear and tear can be achieved. The transfer of aviation and space technology to rail traffic which has thus been demonstrated is governed by the overall concept of "airplane on wheels."

The UD presented a mockup of the middle car of the R/S-VD (wheel/rail experimental and demonstration vehicle) as an example of future railroad technology at the railroad engineering exhibit on the experimental field of the Federal Railroad in Munich-Freimann on the occasion of the 75th anniversary of the Munich Federal Railroad Central Office. The mockup was developed and built by MBB in close cooperation with the Munich Federal Railroad Central Office. The R/S-VD is the prototype forerunner for the train system of the next generation in the German Federal Railroad. This prototype will start its experimental runs in 1985 with the objective of attaining a speed of 350 km/hr. MBB is decisively involved in its development and construction which is being promoted by the BMFT.

More than 300,000 visitors inspected the mockup during the exhibit. Engineer Theo Rahn, B. S., economic engineering, the president of the Munich Federal Railroad Central Office, displayed particular interest in the model. Visitors were impressed with the high degree of innovation in the train, especially the interior furnishings and the passenger information system. In view of the warm weather during the exhibit, the new air conditioning concept, which is rather new in a rail vehicle, proved to be particularly effective and advantageous.

The display of the mockup was used for an opinion survey. The analysis of the questionnaires showed that 90-95 percent of those questioned considered the innovations presented as being between good and very good. The general layout as well as the concept and execution of the interior furnishings, the information system, the seats, the air conditioning, and the windows likewise met with the approval of the representatives of the BMFT and the German Federal Railroad. In addition to the mockup, the model of the FVW high-performance chassis and the slippage-adjusted wheel set produced great interest.

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## TRANSPORTATION

### DORNIER'S 'NEW TECHNOLOGY WING' IN PRACTICAL USE

Frankfurt/Main FRANKFURTER ZEITUNG in German 27 Sep 82 p 8

[Text] Dornier GmbH, Munich--After a development and testing time of about 2-½ years, the series aircraft of the new Utility-Commuter program of Dornier, equipped with the "New Technology Wing" (NTW), will be delivered to international customers under type-designation Dornier 228.

At the end of August, the second aircraft, using the 228-100 design for 15 passengers, bearing plant number 7003 was delivered to the Norwegian Regional Air Company A/S Norving in Kirkenes. This aircraft will be used in regular commuter air service in North Norway. Norring Flying Service has ordered three Dornier 228's. Almost at the same time, another aircraft rolled out of the final assembly shed. It is intended for the Nigerian Industrial concern Bagudu Construction & Commercial Co. Ltd (BCCC) in Minna. The company has been using the DO 28D-2 Skyservant for several years in industrial liaison service between its various construction sites in Nigeria. In all, 19 STOLL-Utility aircraft of the Dornier 128-6 type with turboprop drive and nine other Dornier 228-100/200 aircraft have been ordered by civilian Nigerian customers.

In India, according to a company spokesperson, the coastguard and regional air companies are interested in the procurement of a larger number of Dornier 228 aircraft. Cooperation in this effort with the Indian aircraft manufacturer Hindustan Aeronautics Ltd. (HAL) in Bangalore is being debated. A Dornier 228-200 is also to be delivered this year to the domestic air line Druk Air of the Royal Bhutan air line in the Himalayas. Thus, for the first time there will be regular air service between the capital city of Thimphu--lying in a deep valley surrounded by 5,000 m-tall Himalaya peaks--and North India, and later with the neighboring country of Nepal.

At the end of July 1982 a Dornier 228-100 performed a demonstration flight to Athens and to islands in the Aegean Sea. Olympic Airways wanted to subject the aircraft to a suitability investigation for Greek Island service. The Dornier 228 proved to be a particularly capable and economical commuter aircraft in extremely short landings and take-offs on the sometimes difficult-to-approach islands.

Another presentation trip to Scotland, South England and to the channel island of Jersey was run at the beginning of September. During an air show in Farnborough/England, the Dornier 228-200 version for 19 passengers was presented.

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## TRANSPORTATION

### ASYMMETRIC STERN IMPROVES EFFICIENCY OF SHIP'S PROPELLER

Duesseldorf VDI NACHRICHTEN in German 6 Aug 82 p 24

[Text] The "Thea-S." (6,118 GRT) multipurpose freighter, which put to sea recently, features a novelty in shipbuilding with an asymmetrical stern developed by the Hamburg Engineering Bureau of Noennecke (with the support of the Federal Ministry of Research and Technology). In this way, engineers are coping with the unfavorable flow conditions encountered along the stern in the upper propeller region. In the case of the MV "Thea-S." this involves a ship type which was developed by the shipyard of Heinrich Brand, Oldenburg, together with Elsflether Reederei Schepers; it is 142.05/111.00 m long, it has a beam of 18.60 m, a molded depth of 6.70/10.20 m, and a draft of 7.70 m; it is registered at 6,118 GRT and can carry 8,367 t.

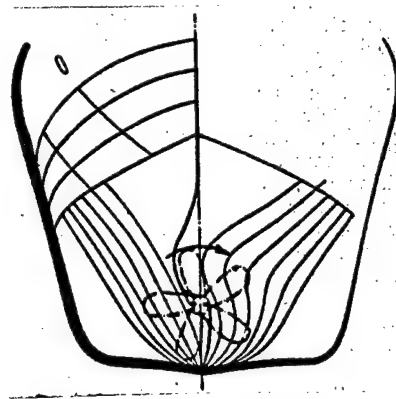
The Hamburg shipbuilding engineer E. Noennecke 20 years ago studied the fact that, in the case of the conventional stern, the water influx toward the propeller runs toward the side where the propeller blade moves upward--especially in the upper waterline region--which is considerably worse than on the other side of the ship.

He developed an asymmetrical stern design where the part of the ship located above the propeller hub is turned with respect to the part below the shaft against the direction of rotation of the propeller. Because of that, the stern water enters the region of the propeller plane, which until now had received a poor influx of water, opposite to the direction of rotation of the propeller, with a forward twist. Here are the results: considerably higher efficiencies of both propeller and engine; this improvement is due to the fact that the flow conditions are distributed over the entire propeller plane.

As we know, the ship's propeller works one-sidedly because its pressure point is not located in the middle of the propeller but is shifted slightly toward one side of the ship. As a result of this, there are minor course deviations while the ship is under way and those deviations must be corrected by moving the rudder in the opposite direction. This is where the asymmetrical stern facilitates considerable improvements.

The measurement runs which were performed prior to the delivery of the ship showed that the output savings of 8 percent--which had been determined already during several model experiments at HSVA (Hamburg Shipbuilding Experimental

Institute)--cannot only be attained but can even be exceeded. With this new stern one can achieve a daily fuel saving of 1.7 t.



The asymmetrical shape of the stern enables us to make sure that the flow conditions along the propeller plane will be improved.

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## TRANSPORTATION

### INSTITUTE STUDIES USE OF COMPOSITE MATERIALS IN AUTO ENGINES

Duesseldorf VDI NACHRICHTEN in German 16 Jul 82 p 8

[Text] Light and thus energy-conserving materials are again moving forward in the area of vehicle production. Progress has been made in the area of engines where, in cooperation with industry and research, modern composite materials should soon come into use. Compared to conventional metal materials, weight-reductions of more than 50 percent can be attained.

In an initial phase, fiberglass-reinforced plastics (GFK) have been used by automobile firms for low-stressed parts, e.g. radiator grill and body parts, and used sometimes in series production.

In a second development step, highly-stressed components were developed from fiber composites, e.g. drive components, wheel suspensions and shock absorbers. The high strength and rigidity requirements of the components can only be met by optimum alignment of fiber reinforcement. Carbon-fiber reinforced plastics (CFK) are being used preferentially here in winding, prepreg, fabric and tape-laying techniques.

Although weight reductions of more than 50 percent can be achieved compared to conventional steel versions, no such component has yet been used in series production. The reasons for this are the high material costs, the as yet unproven long-term service life and the absence of suitable production methods and equipment for large series.

Stimulated by this research work, the German Research and Test Center for Air and Space Travel (DFVLR) began discussions at its Institute for Construction Engineering and Research in Stuttgart on the use of fiber-composites in engines. By reducing the oscillating mass here, the economy of the vehicle could be improved significantly. Severe difficulties arise with regard to the occurring thermal stress--in addition to the high mechanical load.

The DFVLR presented a 1-cylinder diesel engine experimental model at the Hannover exposition whose piston shaft, connecting rod and various piston bolts were made of CFK.

A part of the weight savings is due to the weight reduction in piston shaft counterweight attained through the reduced mass of piston pin, connecting rod and crank-pin. Planning is now aimed at completing the development of the drive train for mass production. In addition, the test engine shall be used to test elements of the drive mechanism control--like valve lifters or push rods--made of fiber-composite materials.

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## TRANSPORTATION

### BRIEFS

AUTOMATIC RIVETER FOR AIRBUS--Einswarden (wa). With the Airbus in high gear, it has become necessary to redesign the production process in order to attain larger output rates coupled with simultaneously improved economy. This is being done first of all with the help of computer-controlled automats which work not only without noise but above all with a high degree of repetition accuracy. At the Einswarden plant, where Airbus section 12/14 is being assembled, engineers have come a good step closer to this goal with the commissioning of the first numerically-controlled five-axis riveting automat for large Airbus fuselage shells. A second five-axis riveting system of the same design will be placed in production this year. The development of the novel riveting automat with positioning unit, promoted with the help of funds from the Federal Ministry of Research and Technology, was accomplished through cooperation with West German enterprises. The advantage here is that the users were able to put in their own technological requirements during the design and construction phase; besides, future spare parts can be procured on short notice and repairs can be performed quickly. An essential feature of this new riveting automat however is represented by the fact that the riveting program is being prepared not, as customary, at the automat itself, but is rather being drawn up during work preparation with computer support. In other words, the riveting automat can continue to work without any delay while a new program is being punched into a punched tape. In addition to guaranteeing production in high gear it is also possible in this way to obtain the goal of "flexibility coupled with variable version mix." The new riveting automat is so designed that it can be used for all present and future work operations, in other words, also for the A 320. The following statistics will show how decisive the use of fast and precisely working riveting automats is: The total number of rivet positions on section 13/14 of the Airbus is almost 100,000. Of that number, 12,900 drilling operations and rivet placement operations are performed on three-part longitudinal seams in shells plus 15,800 on the main clip connections. [Text] [Munich-Ottobrun MBB AKTUELL in German Jul/Aug 82 p 9] 5058

MAGNETIC LEVITATION TRAIN--The 54-m long "Transrapid 06" magnetic suspension train, which consists of two sections, is nearing completion. One of the two sections will be furnished as passenger compartment and the other one will be fitted out as a measurement instrument car. The cables are currently being installed and work is being done on interior furnishings. One of the two sections--already with its final coat of paint--was displayed at the Transport '82 technical fair in Munich in the middle of June; the second one was available at Krauss-Maffei for inspection in the workshop already with its complete interior furnishings. Plans call for the first complete section to be moved to the Emsland experimental facility in February 1983. At this time, 9.3 km of the experimental track are ready; the track's first phase includes 20.6 km; the installation of reaction rails and stator packages in the long-stator linear engine can thus be started shortly. The experimental center on the track in Emsland is also ready. The initial test stand tests with the suspension chassis of the magnetic supporting and guidance system have already been accomplished successfully. The other system components are in production at the enterprises of the Transrapid Magnetic Rail System Consortium. One can expect initial trials on the test track in Emsland, which in its final version will be 31.5 km long, in the spring of 1983. The project, which is being promoted by the Federal Ministry of Research and Technology, is intended to help maintain Germany's lead in the field of magnetic rail system development.

[Text] [Duesseldorf VDI NACHRICHTEN in German 13 Aug 82 p 5] 5058

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